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## ANCIENT BACTERIA AND THE BEGINNINGS OF DISEASE

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GERMS are among the oldest inhabitants of the earth. It is even suggested that while the earth was still forming bacteria were carried from distant planets on meteorites and thus initiated life on the earth. However this may be, bacteria are found in the oldest fossil-bearing rocks of North America, having been discovered by Dr. Charles Walcott in the central portion of Montana in association with fossil algæ, in the substance of which the bacteria were fossilized. Far from being disease-producing these earliest types of bacteria were doubtless of the kind which assist in withdrawing calcium from the sea water. They were rock builders. An analogous form exists in the Atlantic Ocean at the present day, and is especially active around the West Indies in building up the coral reefs.

The form of these most ancient germs is so similar to that of recent bacteria that they are called *Micrococcus*, a bacterial form which is especially common to-day. Considerable comment has been aroused as to the possibility of such delicate organisms as bacteria being capable of preservation in a fossilized condition. This is, however, pretty definitely settled by investigations in other lines. Fossil brains, fossil flowers, fossil blood and fossil muscle are known to be so well preserved that there is permitted an examination of the minute structure of the tissues. Renault, too, has described a great number of bacteria in the coal of France so no doubt exists longer as to the structures seen being bacteria.

Disease, however, did not exist with the most ancient bacteria. They were harmless, as are most of the present-day bacteria. Whether bacterial organisms were instrumental in effecting the origin of disease we do not know. This is a wide field of study which has not yet been explored. In a later geological period bacteria are found in partially decayed bone, together with thread mould and other types of fungi. This condition, however, can not be regarded as disease, but decay in dead material. The earliest animals were free from disease, although they were subject to injuries incident to the life of any

creature. The larger attacked the smaller then as now. Infection of the injured part did not take place in the early periods of animal life, and it is only after the great Coal Period that infected wounds are found.

The Coal Period witnessed the earliest widespread condition of bacteria and fungi, and possibly witnessed the beginning of disease, although there had been previously a mild form of pathology due to the action of parasites. The first diseased conditions preserved are, of course, not the earliest manifestation of disease, since disease is doubtless the result of long ages of struggle between the two contending forces of nature. The early animals were so highly immune to attack by bacterial organisms that it was only after the races of animals began to grow weaker through age that disease was able to make any headway.

It is idle to attempt to place a beginning of any limited time during which disease began. Disease was not present in the earliest times of the earth's history and it did not become very active until the present age of the earth had been attained by nearly three quarters of its duration. That is, disease has only been active during the last one quarter of the earth's history, so far as animals and plants are concerned. The incidence of maladies began slowly, was introduced gradually, and has been an important factor only within relatively recent times. It was a minor and unimportant factor for millions of years.

The action of early parasites on the shells of ancient animals are our oldest evidences of disease. The action of these organisms resulted in the formation of the oldest tumors. Diseased conditions of a very interesting type were caused in the early history of animal life by poisoning of the waters in which the animals lived. This resulted in a thickening of the shell, a twisting of the spirals of snails, or a diminution in size of some forms, certain of the depauperized individuals being only one twentieth their normal size.

The origin and development of disease may be traced to a large extent from the evidences of pathology found on the fossil bones of the ancient races of man and extinct animals, as well as from the associations of the earliest animals. That early man may have acquired some of his diseases from the coexisting animals is evident from the fact that the men of the stone ages, the cave bears, and other cave-inhabiting animals were often afflicted with the same maladies, as may be seen from the diseased appearance of their bones.

It would thus seem that the relation between disease in ancient times and the extinction of great groups of animals like the dinosaurs, was a matter of minor importance. The indications of disease so far seen on ancient bones are the results of accidents, or minor constitutional disturbances which did not endanger the life of the race and seldom that of the individual. The evidence, to be sure, is scanty, being confined to that seen on the hard parts of ancient animals. But on a similar basis is erected our present extensive knowledge of the evolution of animals in past time. Many of the epidemic diseases of to-day which are so fatal to life leave no traces on the bones. It may have been so in past times, to a great extent.

The beginnings of disease are thus seen to be lost in an immense obscurity of time during which the evil forces of nature were battling with the good for supremacy. Immunity doubtless was early established, and strongly entrenched. So firmly guarded were the primitive animals of the first ages of the earth that no disturbing influences entered into their existence. Only when racial old age, and the introduction of other antagonistic influences disturbed this natural immunity did animals see the new factor of disease enter into their lives. Early land animals doubtless lived long lives of placid contentment undisturbed by fear of infection either from within or without. Disease was in its very beginnings and with the land animals spread more and more over the face of the earth as time passed on in a mighty succession of geological ages.